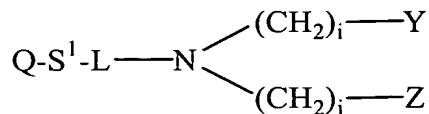


WHAT IS CLAIMED IS:

1. A metal chelating composition having the formula:



wherein

Q is a carrier;  
S<sup>1</sup> is a spacer;  
L is -A-T-CH(X)-;  
A is a thioether, or selenoether linkage;  
T is a bond or substituted or unsubstituted alkyl or alkenyl;  
X is -(CH<sub>2</sub>)<sub>k</sub>CH<sub>3</sub>, -(CH<sub>2</sub>)<sub>k</sub>COOH, -(CH<sub>2</sub>)<sub>k</sub>SO<sub>3</sub>H, -(CH<sub>2</sub>)<sub>k</sub>PO<sub>3</sub>H<sub>2</sub>, -(CH<sub>2</sub>)<sub>k</sub>N(J)<sub>2</sub>, or -(CH<sub>2</sub>)<sub>k</sub>P(J)<sub>2</sub>;  
k is an integer from 0 to 2;  
J is hydrocarbyl or substituted hydrocarbyl;  
Y is -COOH, -H, -SO<sub>3</sub>H, -PO<sub>3</sub>H<sub>2</sub>, -N(J)<sub>2</sub>, or -P(J)<sub>2</sub>;  
Z is -COOH, -H, -SO<sub>3</sub>H, -PO<sub>3</sub>H<sub>2</sub>, -N(J)<sub>2</sub>, or -P(J)<sub>2</sub>; and  
i is an integer from 0 to 4.

2. The metal chelating composition of claim 1 wherein L is -A-T-CH(X)-, A is an ether linkage, and T and X are as defined in claim 1.

3. The metal chelating composition of claim 2 wherein S<sup>1</sup> consists of a chain of no more than about 25 atoms selected from the group consisting of carbon, nitrogen, oxygen and sulfur.

4. The metal chelating composition of claim 2 wherein S<sup>1</sup> consists of a chain of no more than about 25 atoms selected from the group consisting of carbon, oxygen and sulfur.

5. The metal chelating composition of claim 2 wherein S<sup>1</sup> consists of a chain of no more than about 15 atoms selected from the group consisting of carbon, oxygen and sulfur and T is -(CH<sub>2</sub>)<sub>n</sub>- wherein n is 0 to 6.

6. The metal chelating composition of claim 5 wherein X is  $-(CH_2)_kCOOH$ , Y is hydrogen or  $-COOH$ , Z is hydrogen or  $-COOH$  and k is as defined in claim 1.

7. The metal chelating composition of claim 5 wherein X is  $-(CH_2)_kCOOH$ ; Y is  $-COOH$ , Z is hydrogen or  $-COOH$  and k is as defined in claim 1.

8. The metal chelating composition of claim 1 wherein A is an amide linkage.

9. The metal chelating composition of claim 8 wherein the carrier is selected from the group consisting of agarose, cellulose, methacrylate co-polymers, polystyrene, polypropylene, paper, polyamide, polyacrylonitrile, polyvinylidene, polysulfone, nitrocellulose, polyester, polyethylene, silica, glass, latex, plastic, gold, iron oxide, polyacrylamide, nucleic acid, lipids, liposomes, synthetic soluble polymers, proteins, polyamino acids, albumin, antibodies, enzymes, streptavidin, peptides, hormones, chromogenic dyes, fluorescent dyes, flurochromes, and polysaccharides.

10. The metal chelating composition of claim 8 wherein S<sup>1</sup> consists of a chain of no more than about 25 atoms selected from the group consisting of carbon, nitrogen, oxygen and sulfur.

11. The metal chelating composition of claim 8 wherein S<sup>1</sup> consists of a chain of no more than about 25 atoms selected from the group consisting of carbon, oxygen and sulfur.

12. The metal chelating composition of claim 8 wherein S<sup>1</sup> consists of a chain of no more than about 15 atoms selected from the group consisting of carbon, oxygen and sulfur and T is  $-(CH_2)_n-$  wherein n is 0 to 6.

13. The metal chelating composition of claim 12 wherein X is  $-(CH_2)_kCOOH$ , Y is hydrogen or  $-COOH$ , Z is hydrogen or  $-COOH$  and k is as defined in claim 1.

14. The metal chelating composition of claim 12 wherein X is  $-(CH_2)_kCOOH$ ; Y is  $-COOH$ , Z is hydrogen or  $-COOH$  and k is as defined in claim 1.

15. A metal chelate comprising a chelate of a metal and the metal chelating composition of claim 1.
16. The metal chelate of claim 15 wherein the metal is selected from the group consisting of Ni, Hg, Ga, Cu, Ru, Co, Cd, Mg, Mn, Ti, In, Zn, Tc, Rh, Pd, Re, Fe, Au, Pb, and Bi.
17. The metal chelate of claim 15 wherein the metal is selected from the group consisting of Fe, Cu, Co, Au, and Ni.
18. The metal chelate of claim 15 wherein the metal is nickel.
19. A process for the purification or detection of a composition, the process comprising contacting the composition with a metal chelate of claim 15.
20. The process of claim 19 wherein the composition is a polypeptide containing at least two histidine residues.
21. The process of claim 19 wherein the composition is a polypeptide containing at least six histidine residues.
22. The process of claim 19 wherein the composition is a protein, phosphoprotein, peptide, phosphopeptide, nucleic acid, oligonucleotide, drug, or synthetic or natural product having an affinity for a metal chelate.
23. A process for the preparation of a mono- or dicarboxylated amine, the process comprising combining an amine and an oxoacid in the presence of a reducing agent, the amine having the formula  $R^2R^3NH$  wherein  $R^2$  is hydrocarbyl or substituted hydrocarbyl and  $R^3$  is hydrogen, hydrocarbyl or substituted hydrocarbyl.
24. The process of claim 23 wherein the oxoacid is glyoxylic acid.
25. The process of claim 23 wherein the reducing agent is a pyridine-borane complex, dimethylborane, trimethylborane, or sodium cyanoborohydride.
26. The process of claim 23 wherein the amine is an amino acid.

27. The process of claim 23 wherein the amine is an amino acid selected from the group consisting of cystine, homocystine, cysteine, homocysteine, aspartic acid, cysteic acid or an ester thereof.

28. The process of claim 23 wherein the amine is cystine, cysteine, cysteic acid or an ester thereof.